PRICE $1.00

Assembling
and Using Your...

Heathkit

DECADE CONDENSER

MODEL DC-1

HEATH COMPANY

A Subsidiary of Daystrom Inc.

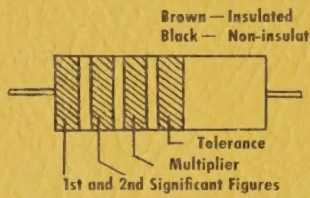
BENTON HARBOR, MICHIGAN

595-45

STANDARD COLOR CODE — RESISTORS AND CAPACITORS

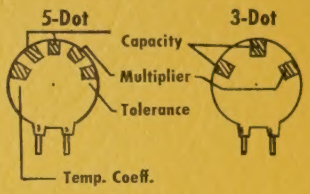
INSULATED UNINSULATED Color	FIRST RING BODY COLOR First Figure	SECOND RING END COLOR Second Figure	THIRD RING DOT COLOR Multiplier
BLACK	0	0	None
BROWN	1	1	0
RED	2	2	00
ORANGE	3	3	,000
YELLOW	4	4	0,000
GREEN	5	5	00,000
BLUE	6	6	000,000
VIOLET	7	7	0,000,000
GRAY	8	8	00,000,000
WHITE	9	9	000,000,000

AXIAL LEAD RESISTOR

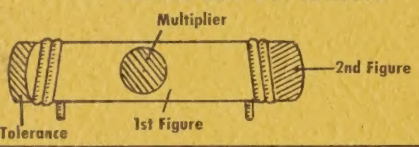


Wire wound resistors have 1st digit band double width

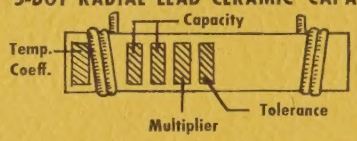
DISC CERAMIC RMA CODE



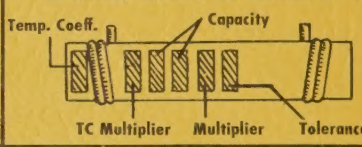
RADIAL LEAD DOT RESISTOR



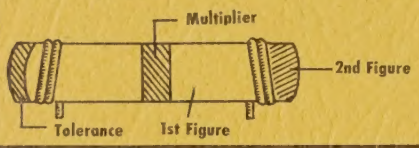
5-DOT RADIAL LEAD CERAMIC CAPACITOR



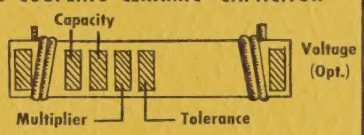
EXTENDED RANGE TC CERAMIC HICAP



RADIAL LEAD (BAND) RESISTOR



BY-PASS COUPLING CERAMIC CAPACITOR



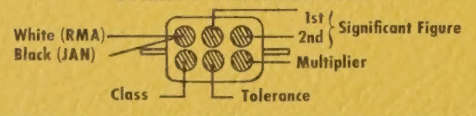
AXIAL LEAD CERAMIC CAPACITOR

The standard color code provides all necessary information required to properly identify color coded resistors and capacitors. Refer to the color code for numerical values and the zeroes or multipliers assigned to the colors used. A fourth color band on resistors determines tolerance rating as follows: Gold = 5%, silver = 10%. Absence of the fourth band indicates a 20% tolerance rating.

The physical size of carbon resistors is determined by their wattage rating. Carbon resistors most commonly used in Heathkits are ½ watt. Higher wattage rated resistors when specified are progressively larger in physical size. Small wire wound resistors ½ watt, 1 or 2 watt may be color coded but the first band will be double width.

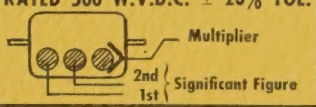
MOLDED MICA TYPE CAPACITORS

CURRENT STANDARD CODE

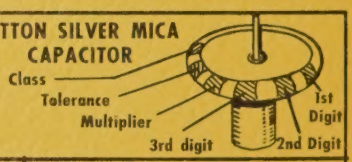


JAN & 1948 RMA CODE

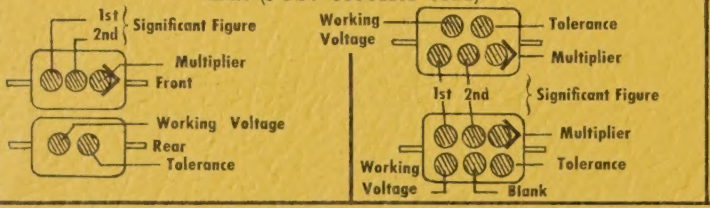
RMA 3-DOT (OBSOLETE) RATED 500 W.V.D.C. ± 20% TOL.



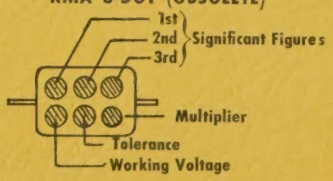
BUTTON SILVER MICA CAPACITOR



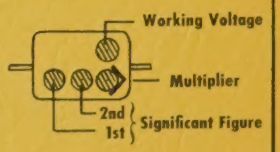
RMA (5-DOT OBSOLETE CODE)



RMA 6-DOT (OBSOLETE)

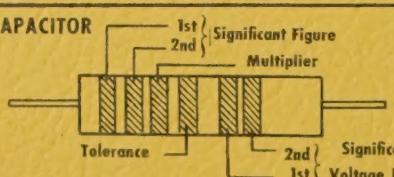


RMA 4-DOT (OBSOLETE)



MOLDED PAPER TYPE CAPACITORS

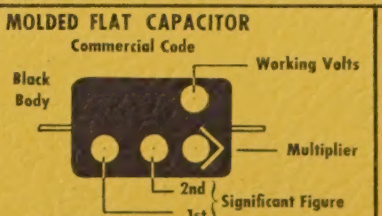
TUBULAR CAPACITOR



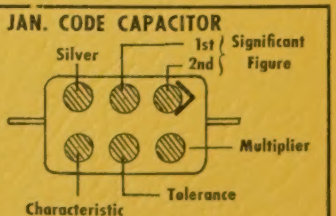
Normally stamped for value

A 2 digit voltage rating indicates more than 900 V. Add 2 zeros to end of 2 digit number.

MOLDED FLAT CAPACITOR



JAN. CODE CAPACITOR

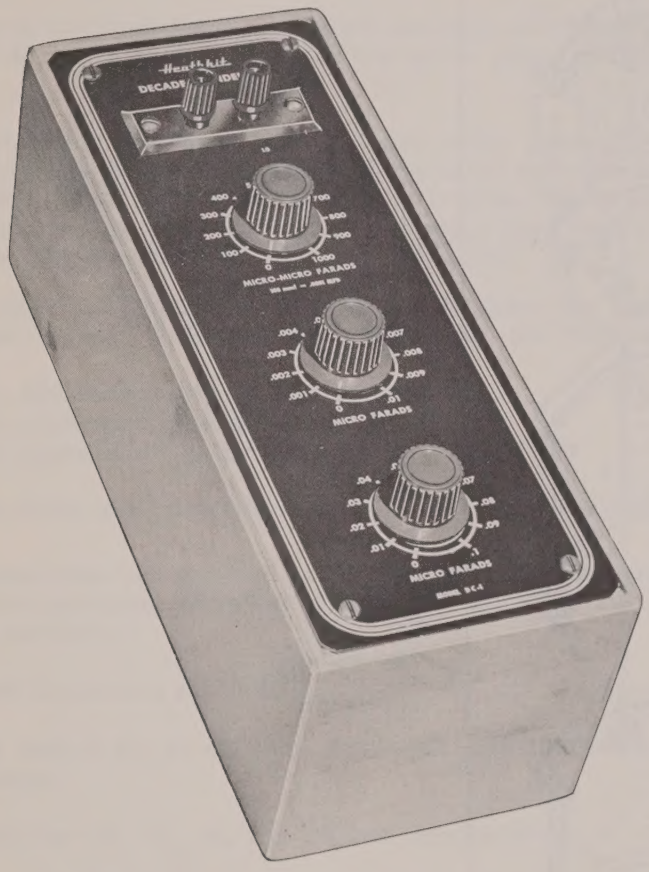


The tolerance rating of capacitors is determined by the color code. For example: red = 2%, green = 5%, etc. The voltage rating of capacitors is obtained by multiplying the color value by 100. For example: orange = 3 × 100 or 300 volts. Blue = 6 × 100 or 600 volts.

In the design of Heathkits, the temperature coefficient of ceramic or mica capacitors is not generally a critical factor and therefore Heathkit manuals avoid reference to temperature coefficient specifications.

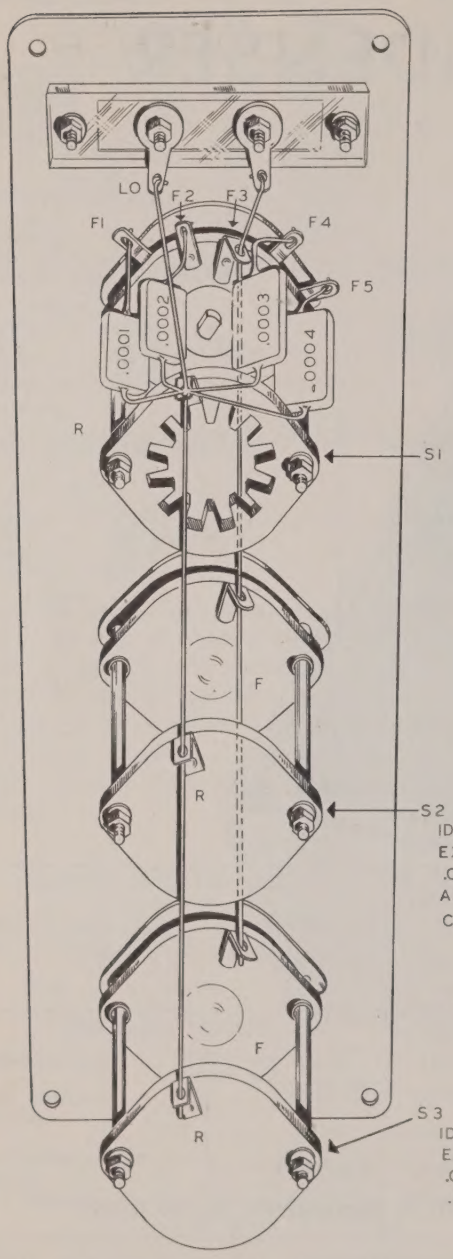
Courtesy of Centralab

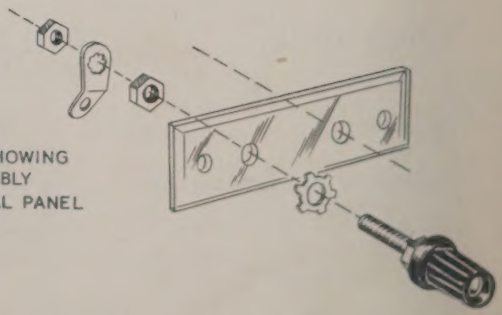
HEATHKIT
DECADE CONDENSER
MODEL DC-1



SPECIFICATIONS

Range	100 mmf. to 0.111 mfd. in increments of 100 mmf.
Voltage Rating	350 volts DC, continuous; 500 volts DC, intermittent, 1000 volts DC test.
Dielectric	Silver mica
Accuracy of Incremental Capacity	Plus or minus 1%
Zero capacitance	15 to 20 mmf. with all switches set at zero
Dimensions	3 3/4" wide, 4 3/4" high, 10 5/8" deep
Shipping Weight	4 lbs.





DETAIL SHOWING ASSEMBLY OF TERMINAL PANEL

CONSTRUCTION AND USE
OF THE
HEATHKIT MODEL DC-1 DECADE CONDENSER

The Heathkit Model DC-1 Decade Condenser is a laboratory instrument offering the utmost in convenience, accuracy, and stability. In order that you may realize these advantages, we strongly recommend that you follow these construction notes carefully. You will be repaid many times over for the extra care and time taken in assembling and wiring the instrument.

Start by laying out the parts and checking them against the parts list. This will help you identify the components. In case of a shortage, please notify us at once, and return the inspection slip packed with your kit.

In order to simplify construction, the three switches are wired separately and then mounted on the panel. Begin construction by carefully studying one of the switches and referring to the pictorial diagram. Note that on the rear wafer only one terminal lug is used. This has been designated as R on the diagram. The five lugs on the front wafer have been designated as shown. We suggest that you follow this procedure in wiring the switches:

1. Push one lead of the .0001 mfd. condenser through F1. Position the body of the condenser midway between the two wafers. Crimp the other lead at R. DO NOT SOLDER ANY CONNECTIONS YET.
2. Similarly, connect the .0002 mfd. condenser between F2 and R.
3. Connect the .0003 mfd. condenser between F4 and R.
4. Connect the .0004 mfd. condenser between F5 and R.

Note that no connection is made to F3 until the switch is mounted on the panel.

Carefully recheck the connections just outlined. Be sure that the proper values of condensers are used in their respective positions. When satisfied that the switch is correctly wired, solder each connection except R carefully.

The assembly just finished comprises switch S1.

In the same manner, wire switch S2, except that .004, .003, .002 and .001 mfd. condensers are used as shown in the pictorial.

Then wire switch S3, using the .04, .03, .02, and .01 mfd. condensers.

Mount the binding posts on their insulator plate, as shown in the detail drawing.

Mount the insulator plate on the front panel, with the plate on the finished side of the panel. Use the 6-32 machine screws, lockwashers and nuts for mounting.

Mount the switches as shown, S1 nearest the terminal board, S2 in the center, and S3 at the bottom.

Stretch the bare wire to remove any kinks. Slip a length of bare wire through Terminal F3 on each of the three switches. Do not attempt to crimp the wire at each switch lug. Connect the other end of this wire to the "high" terminal. Solder each connection carefully.

Slip a length of bare wire through the R terminals of the three switches, and connect the other end to the "low" terminal. Solder the four connections.

Rotate all switch shafts to full counterclockwise. Set the three pointer knobs at 0 and tighten the set screws. Mount the panel on the cabinet and mark location of the corner screw holes. Drill or pierce starting holes and fasten the panel to the cabinet with the four #6 x 5/8" sheet metal screws. This completes the instrument.

APPLICATION

Decade condensers of this type are invaluable in development and general design work. The accuracy and stability of the condensers used in the DC-1 are more than adequate for such applications. Because of the speed and convenience, it is often more desirable to use the condenser decade to determine capacitive circuit values, and so avoid involved calculations. The unit is useful in design of any circuits where capacity values are relatively large. The DC-1 has a fixed minimum capacity of approximately 18 mmf. when assembled and wired as described herein. This minimum must be compensated for wherever it represents a significant portion of the total C involved. Also, it should be pointed out that there is an appreciable capacity from each terminal of the instrument to the panel. In applications where this might be important, be sure the "Low" terminal is connected to the lower impedance point in the circuit under measurement. Regardless of application, the voltage limitations shown in the specifications should be observed.

CIRCUIT

The heart of the circuit in the DC-1 is the design of the switch involved. As the switch is rotated, it automatically selects one of, or a combination of, the four silver mica condensers so as to present across the switch terminals F and R a capacity increment equal to the marked value. These terminals on each of the three switches are paralleled. The total capacity can be read by adding the settings of the three pointers. Remember also that the fixed minimum (18 mmf. or so) is present, even when all the pointers are at zero.

IN CASE OF DIFFICULTY

Recheck the wiring of each switch carefully. Most cases of difficulty in assembly of kits can be traced to mistakes in wiring. Sometimes having another person check the wiring will show up an error consistently being overlooked.

REPLACEMENTS

Material supplied with Heathkits has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally improper instrument operation can be traced to a faulty component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information:

A. Thoroughly identify the part in question by using the part number and description found in the manual parts list.
B. Identify the type and model number of kit in which it is used.
C. Mention the order number and date of purchase.
D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. Please do not return the original component until specifically requested to do so. Do not dismantle the component in question as this will void the guarantee. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SERVICE

In event continued operational difficulties of the completed instrument are experienced, the facilities of the Heath Company Service Department are at your disposal. Your instrument may be returned for inspection and repair for a service charge of $3.00 plus the price of any additional material that may be required. THIS SERVICE POLICY APPLIES ONLY TO COMPLETED INSTRUMENTS CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Instruments that are not entirely completed or instruments that are modified in design will not be accepted for repair. Instruments showing evidence of acid core solder or paste fluxes will be returned not repaired.

The Heath Company is willing to offer its full cooperation to assist you in obtaining the specified performance level in your instrument. Factory repair service is available to you or you may contact the Technical Consultation Department by mail. For information regarding possible modification of existing kits, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at any electronic outlet store. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for specific purposes. Therefore, such modifications must be made at the discretion of the kit builder according to information which will be much more readily available from some local source.

SHIPPING INSTRUCTIONS

Before returning a unit for service, be sure that all parts are securely mounted.

ATTACH A TAG TO THE INSTRUMENT GIVING NAME, ADDRESS AND TROUBLE EXPERIENCED.

Pack in a rugged container, preferably wood, using at least three inches of shredded newspaper or excelsior on all sides. DO NOT SHIP IN THE ORIGINAL KIT CARTON AS THIS CARTON IS NOT CONSIDERED ADEQUATE FOR SAFE SHIPMENT OF THE COMPLETED INSTRUMENT. Ship by prepaid express if possible. Return shipment will be made by express collect. Note that a carrier cannot be held liable for damage in transit if packing, in HIS OPINION, is insufficient.

All prices are subject to change without notice. The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

WARRANTY

Heath Company warrants that for a period of three months from the date of shipment, all Heathkit parts shall be free of defects in materials and workmanship under normal use and service and that in fulfillment of any breach of such warranty, Heath Company shall replace such defective parts upon the return of the same to its factory. The foregoing warranty shall apply only to the original buyer, and is and shall be in lieu of all other warranties, whether express or implied and of all other obligations or liabilities on the part of Heath Company and in no event shall Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or operation of Heathkits or components thereof. No replacement shall be made of parts damaged by the buyer in the course of handling or assembling Heathkit equipment.

NOTE: The foregoing warranty is completely void and we will not replace, repair or service instruments or parts thereof in which acid core solder or paste fluxes have been used.

HEATH COMPANY

PARTS LIST

PART No.	PARTS Per Kit	DESCRIPTION
Mica Condensers		
20-13	1	.0001 μfd 1% 350 v.
20-14	1	.0002 μfd 1% 350 v.
20-15	1	.0003 μfd 1% 350 v.
20-16	1	.0004 μfd 1% 350 v.
20-17	1	.001 μfd 1% 350 v.
20-18	1	.002 μfd 1% 350 v.
20-19	1	.003 μfd 1% 350 v.
20-20	1	.004 μfd 1% 350 v.
20-21	1	.01 μfd 1% 350 v.
20-22	1	.02 μfd 1% 350 v.
20-23	1	.03 μfd 1% 350 v.
20-24	1	.04 μfd 1% 350 v.

PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous		
63-39	3	Ceramic switch, parallel decade
75-6	1	Insulator plate
91-6	1	Cabinet
100-M16B	2	Binding post cap assemblies
427-2	2	Binding post bases
203-M37F8	1	Panel
250-9	2	6-32 x 3/8" Machine screws
250-12	4	#6 x 5/8" Sheet metal screws
252-3	4	6-32 x 1/4" Hex nuts
252-7	3	3/8" - 32 Control nuts
253-10	3	Control flat washers
254-4	3	Control lock washers
254-6	4	#6 Lockwashers (external teeth)
259-1	2	#6 Solder lugs
340-3	1	length #16 Bare solid tinned wire
462-19	3	Skirted knob
595-45	1	Manual

HELPFUL KIT BUILDING INFORMATION

Before attempting actual kit construction read the construction manual through thoroughly to familiarize yourself with the general procedure. Note the relative location of pictorials and pictorial inserts in respect to the progress of the assembly procedure outlined.

This information is offered primarily for the convenience of novice kit builders and will be of definite assistance to those lacking thorough knowledge of good construction practices. Even the advanced electronics enthusiast may benefit by a brief review of this material before proceeding with kit construction. In the majority of cases, failure to observe basic instruction fundamentals is responsible for inability to obtain desired level of performance.

RECOMMENDED TOOLS

The successful construction of Heathkits does not require the use of specialized equipment and only basic tools are required. A good quality electric soldering iron is essential. The preferred size would be a 100 watt iron with a small tip. The use of long nose pliers and diagonal or side cutting pliers is recommended. A small screw driver will prove adequate and several additional assorted screw drivers will be helpful. Be sure to obtain a good supply of rosin core type radio solder. Never use separate fluxes, paste or acid solder in electronic work.

ASSEMBLY

In the actual mechanical assembly of components to the chassis and panel, it is important that the procedure shown in the manual be carefully followed. Make sure that tube sockets are properly mounted in respect to keyway or pin numbering location. The same applies to transformer mountings so that the correct transformer color coded wires will be available at the proper chassis opening.

Make it a standard practice to use lock washers under all 6-32 and 8-32 nuts. The only exception being in the use of solder lugs—the necessary locking feature is already incorporated in the design of the solder lugs. A control lock washer should always be used between the control and the chassis to prevent undesirable rotation in the panel. To improve instrument appearance and to prevent possible panel marring use a control flat nickel washer under each control nut.

When installing binding posts that require the use of fiber insulating washers, it is good practice to slip the shoulder washer over the binding post mounting stud before installing the mounting stud in the panel hole provided. Next, install a flat fiber washer and a solder lug under the mounting nut. Be sure that the shoulder washer is properly centered in the panel to prevent possible shorting of the binding post.

WIRING

When following wiring procedure make the leads as short and direct as possible. In filament wiring requiring the use of a twisted pair of wires allow sufficient slack in the wiring that will permit the twisted pair to be pushed against the chassis as closely as possible thereby affording relative isolation from adjacent parts and wiring.

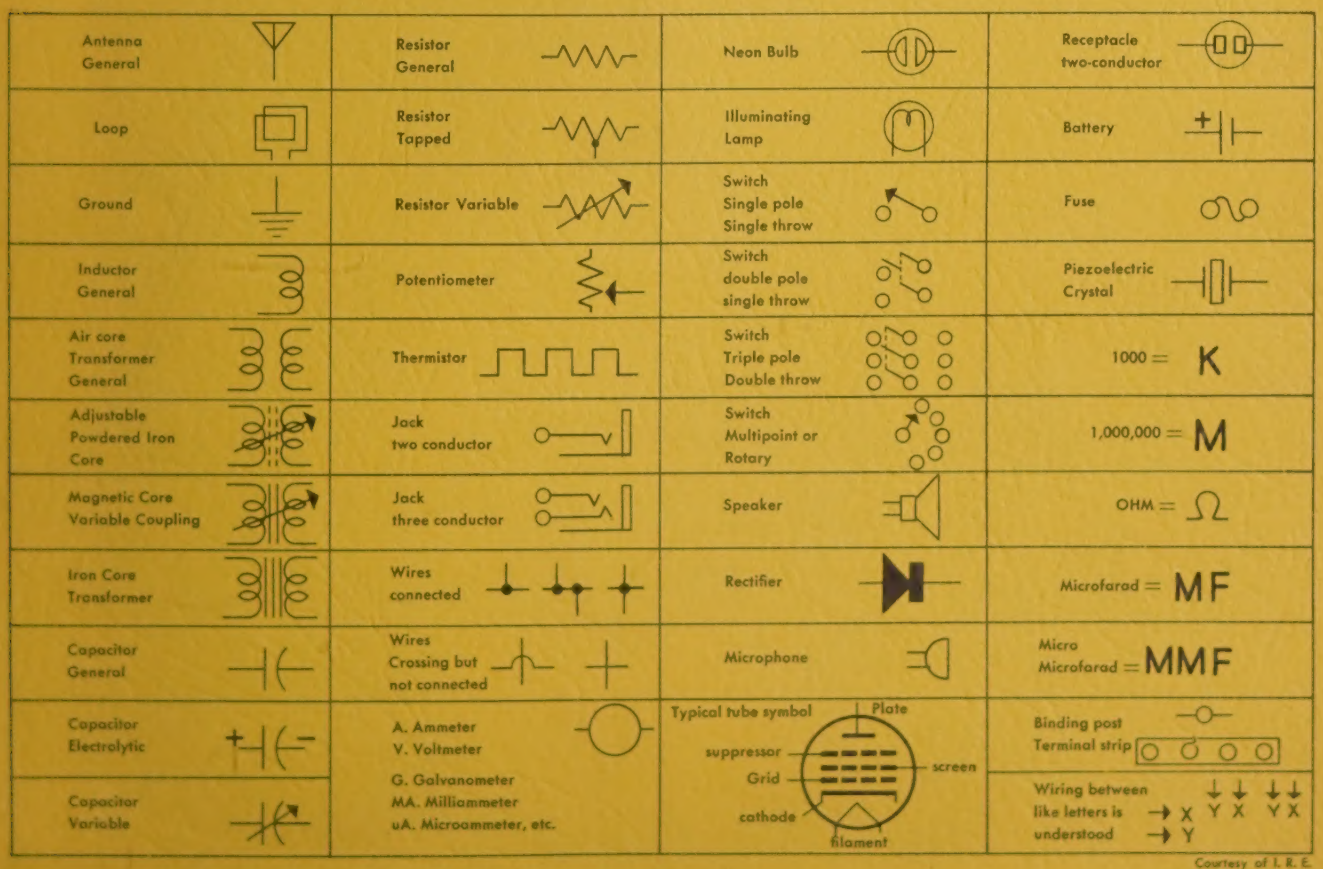
When removing insulation from the end of hookup wire, it is seldom necessary to expose more than a quarter inch of the wire. Excessive insulation removal may cause a short circuit condition in respect to nearby wiring or terminals. In some instances, transformer leads of solid copper will have a brown baked enamel coating. After the transformer leads have been trimmed to a suitable length, it is necessary to scrape the enamel coating in order to expose the bright copper wire before making a terminal or soldered connection.

In mounting parts such as resistors or condensers, trim off all excess lead lengths so that the parts may be installed in a direct point-to-point manner. When necessary use spaghetti or insulated sleeving over exposed wires that might short to nearby wiring.

It is urgently recommended that the wiring dress and parts layout as shown in the construction manual be faithfully followed. In every instance, the desirability of this arrangement was carefully determined through the construction of a series of laboratory models.

SOLDERING

Much of the performance of the kit instrument, particularly in respect to accuracy and stability, depends upon the degree of workmanship used in making soldered connections. Proper soldered connections are not at all difficult to make but it would be advisable to observe a few precautions. First of all before a connection is to be soldered, the connection itself should be clean and mechanically strong. Do not depend on solder alone to hold a connection together. The tip of the soldering iron should be bright, clean and free of excess solder. Use enough heat to thoroughly flow the solder smoothly into the joint. Avoid excessive use of solder and do not allow a flux flooding condition to occur which could conceivably cause a leakage path between adjacent terminals on switch assemblies and tube sockets. This is particularly important in instruments such as the VTVM, oscilloscope and generator kits. Excessive heat will also burn or damage the insulating material used in the manufacture of switch assemblies. Be sure to use only good quality rosin core radio type solder.



Courtesy of I. R. E.

HEATH COMPANY

A Subsidiary of Daystrom Inc.

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

BENTON HARBOR, MICHIGAN

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1001840

11/10/58

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Benton Harbor, Michigan

Litho in